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ANNUAL REPORT

OF THE

INSPECTOR

OF

Gas Meters and Illuminating Gas.

JANUARY, 1896.

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Commonwealth of Massachusetts.

Office of the Secretary, Boston, Jan. 31, 1896.

Hon. George v. L. Meyer, *Speaker, House of Representatives.*

Sir: — I have the honor to transmit herewith, for the use of the Legislature, the report of the Inspector of Gas Meters and of Illuminating Gas.

Respectfully,

WM. M. OLIN,
Secretary.

REPORT.

OFFICE OF GAS INSPECTION,
32 HAWLEY STREET, BOSTON, Jan. 30, 1896.

To the Honorable Senate and the House of Representatives.

The Inspector of Gas Meters and of Illuminating Gas submits the following report: —

During the year ending Dec. 31, 1895, 28,408 gas meters were inspected. Of this number, 27,451 were either new or repaired meters, presented for inspection by the manufacturers or gas companies, as required by law. A number of these meters, being found to register incorrectly, were returned for adjustment and then retested.

Section 12, chapter 61, Public Statutes, provides that a consumer or gas company may request the official inspection of a meter in use. If the meter is correct, the party requesting the inspection pays the expense of removing the meter and having it tested; while, if the meter prove to be incorrect, the gas company must pay all charges and furnish a new meter to the consumer. Of this class, 959 meters were tested last year, with the following results: 549, or 57.36 per cent., were correct within the legal limits of 2 per cent. fast or slow, and were re-sealed; 301 were fast, that is, registered against the consumer, the average error being 4.73 per cent.; 93 were slow, that is, registered against the gas company, the average error being 9.72 per cent.; 1 meter would not pass gas, while 13 would pass gas but would not register. The average error of the 943 registering meters was .4 of 1 per cent. fast. The greatest error in the fast meters was 22 per cent.; there were 2,15 per cent., 16 between 10 and 15 per cent. and 97 between 5 and 10 per cent. fast. Of the slow meters, 1 registered 237½ per

cent. against the gas company; 1, 112 per cent.; 3, between 50 and 65 per cent.; 3, between 20 and 35 per cent.; 5, between 15 and 20; 7, between 10 and 15; and 47, between 5 and 10 per cent. slow.

The following table gives the comparison for the last five years of these reinspected meters: —

YEAR.	Fast Meters.		Slow Meters.		Correct.	Total.	
	Number.	Per Cent.	Number.	Per Cent.	Meters.	Number.	Per Cent.
1891,	52	4.74	34	10.03	144	230	0.41 slow.
1892,	105	5.67	49	9.28	190	344	0.41 fast.
1893,	197	5.10	46	9.30	284	527	1.23 fast.
1894,	217	4.70	55	8.56	327	604	0.99 fast.
1895,	301	4.73	93	9.72	549	957	0.40 fast.

Private meter inspectors have again appeared in the State, testing consumer's meters in place, by re-measuring the gas through a small dry meter, — a method not conducive to accurate results. It would seem that the consumers go to needless expense in having meters tested in such manner, when they have the right to an official inspection by this office at a very much less cost, if any, than for the private test. This matter has been referred to before in the inspector's reports of January, 1891, and January, 1893.

With the increasing number of meters used comes a demand for meter provers; and, as last year, five provers have been standardized during 1895. This is a delicate operation, and requires atmospheric conditions comparatively hard to obtain.

The inspection of the gas supplied by the 69 companies has proceeded much as usual, 544 inspections having been made by the inspector and assistant inspector. Two inspections yearly are made of each company, and an additional one for every six million feet of gas supplied, until the tests become weekly. A test comprises the determination of candle-power, amount of sulphur and ammonia and presence of

sulphuretted hydrogen. The higher candle-power water gases are tested for candle-power by the Sugg's table top open burner, six feet size; the mixed gases and coal gas by the Sugg's London Argand improved form, size F. This improved form increases the candle-power from one-half to three-quarters of a candle, but, as it fulfils the requirements of the law, it has been adopted as the standard Argand for testing purposes.

The tables following give the number of inspections, the average candle-powers, sulphurs and ammonias of the various companies: —

Larger Companies.

Number of Inspections made.	NAME OF PLACE OR COMPANY.	CANDLE-POWER.			GRAINS PER ONE HUNDRED FEET OF GAS OF —	
		Average.	Highest.	Lowest.	Sulphur.	Ammonia.
52	Boston,	24.31	26.1	21.3	8.79	1.—
5	Brockton,	20.38	22.0	18.8	9.28	4.80
25	Brookline,	26.67	29.6	24.6	6.75	1.—
26	Cambridge,	17.88	19.3	15.5	11.33	1.—
17	Charlestown,	18.58	20.2	16.6	11.45	1.—
7	Chelsea,	18.06	18.9	17.0	11.20	2.86
19	Dorchester,	24.77	26.7	23.2	9.53	1.—
9	East Boston,	17.37	18.4	16.3	10.04	4.92
11	Fall River,	22.58	25.5	19.8	8.70	1.—
5	Fitchburg,	18.00	18.5	17.1	11.22	2.76
5	Gloucester,	18.34	18.9	17.9	9.85	1.—
12	Haverhill,	25.03	27.0	23.5	6.69	1.—
10	Holyoke,	17.30	18.7	14.4	11.19	5.96
10	Jamaica Plain,	18.32	19.3	16.7	9.15	2.97
13	Lawrence,	19.55	20.5	18.9	9.58	1.—
42	Lowell,	20.21	22.3	17.6	9.33	1.54
17	Lynn,	18.95	20.0	17.6	10.47	1.55
9	Malden,	18.06	18.7	17.5	9.74	1.—
9	New Bedford,	18.73	20.0	16.9	8.70	1.—
13	Newton,	18.25	18.9	17.3	11.74	1.—
5	North Adams,	18.92	19.7	18.5	11.70	3.36
32	Roxbury,	24.14	26.3	19.4	8.90	1.—
8	Salem,	18.36	19.8	17.6	11.72	2.72
15	South Boston,	24.79	25.3	23.8	9.38	1.—
17	Springfield,	18.46	21.4	16.3	11.01	3.29
8	Taunton,	17.79	18.3	16.5	12.16	11.45
6	Waltham,	18.75	22.2	16.9	3.38	1.70
26	Worcester,	19.56	21.5	18.5	11.57	2.08
	Average,	20.08	–	–	9.81	2.26

Smaller Companies.

Number of Inspections made.	NAME OF PLACE OR COMPANY.	Candle-power.	Grains per One Hundred Feet of Gas of—	
			Sulphur.	Ammonia.
2	Adams, ...	20.50	4.85	1.00
3	Amesbury, ...	22.10	8.07	1.—
3	Arlington, ...	18.60	10.60	1.33
3	Athol, ...	18.60	7.10	1.—
3	Attleborough, ...	17.37	4.37	6.13
3	Beverly, ...	17.67	8.93	5.00
3	Chicopee, ...	21.00	4.70	1.—
3	Clinton, ...	17.17	11.47	1.—
3	Danvers, ...	18.20	12.70	1.33
3	Dedham, ...	18.57	13.43	1.—
2	Easthampton, ...	20.25	7.85	3.10
3	Greenfield, ...	17.50	7.07	9.30
4	Manufacturers' (Fall River), .	17.70	7.00	2.17
3	Marblehead, ...	17.63	12.90	1.—
3	Marlborough, ...	17.93	11.47	1.03
3	Milford, ...	17.63	10.10	4.17
2	Nantucket, ...	17.10	6.60	1.40
3	Natick, ...	17.60	9.40	1.—
3	Newburyport, ...	18.10	13.27	1.—
4	North Attleborough, . .	17.15	8.85	14.75
4	Northampton, . . .	18.60	7.00	1.62
2	Norwood, ...	19.55	16.25	5.80
4	Pittsfield, ...	25.92	7.30	1.—
3	Plymouth, ...	17.27	9.10	2.10
3	Quincy, ...	16.90	11.07	2.30
3	Spencer, ...	19.43	4.63	1.—
3	Wakefield, ...	17.40	10.26	1.03
2	Ware, ...	17.50	8.80	8.30
2	Webster, ...	18.35	4.85	1.—
3	Westfield, ...	18.57	5.60	1.—
3	Woburn, ...	17.90	7.80	1.—
	Average, ...	18.61	8.82	2.65

Companies making Gas from Petroleum.

Number of Inspections made.	NAME OF PLACE OR COMPANY.	Candle-power.
2	Amherst,	39.55
2	Chicopee Falls,	29.05
2	Gardner,	39.70
2	Ipswich,	28.00
2	Leominster,	28.70
2	Lexington,	30.35
2	Middleborough,	24.80
2	Southbridge,	28.75
2	Stoughton,	43.20
2	Williamstown,	37.90
	Average,	33.00

Leaving out the oil-gas companies, the averages for the State were: candle-power, 19.30, a decrease of .01; sulphur, 9.29, a decrease of .18; and ammonia, 2.46, a decrease of .11. The 38 coal gases averaged 18.03, an increase of .05 candles; the 11 water gases averaged 23.28, a decrease of .36 candles; and the 10 mixed coal and water gases averaged 19.65, an increase of .02 candles.

At Gloucester, Plymouth, Manufacturers' of Fall River and Westfield the tests have been made at the works, as being the most available places.

Springfield has added a water-gas plant, to be run in conjunction with the coal gas; Adams has turned over to water gas.

The results of these tests have been forwarded to the Board of Gas and Electric Light Commissioners from time to time during the year, at its request.

The following tables give the particulars in which the law has been violated during the year: —

Deficient candle-power: —

Cambridge, February 19,	15.5	candle-power.
Clinton, March 22,	15.6	" "
Holyoke, July 19,	14.4	" "

Excesses of sulphur: —

Jamaica Plain, January 16,	20.3	grains sulphur.
Holyoke, January 18,	21.8	" "

Excesses of ammonia: —

Taunton, January 24,	16.9	grains ammonia.
Taunton, September 25,	19.2	" "
Taunton, December 24,	29.5	" "
Greenfield, March 7,	18.5	" "
East Boston, April 9,	10.5	" "
Ware, April 11,	15.8	" "
Attleborough, April 16,	10.4	" "
Holyoke, May 2,	10.6	" "
North Attleborough, May 10,	41.7	" "
Springfield, August 15,	14.3	" "
Springfield, September 13,	10.7	" "
Jamaica Plain, December 5,	12.8	" "

Sulphuretted hydrogen detected: —

Amesbury, February 1.
Amesbury, May 3.
Amesbury, October 24.
Middleborough, February 13.
North Adams, March 14.
North Adams, December 18.
Chicopee Falls, March 29.
Chicopee Falls, October 31.
Southbridge, April 4.
Gardner, April 10.
Gardner, December 17.
Williamstown, October 16.
Amherst, October 30.
Arlington, November 23.
Athol, December 17.

The sulphur and ammonia results are in grains per 100 feet of gas. At Springfield the excesses were consecutive, but the next test, made October 10, gave only 1.6 grains.

At Amesbury, Chicopee Falls and Gardner the detection of sulphuretted hydrogen was for the third consecutive time, and in each case a fine became due.

As ammonia has a market value worth considering, and as it is not difficult to remove a large proportion of it, the companies generally keep below the legal limit of 10 grains per 100 feet of gas; but when the apparatus is small compared with the output, so that the gas is washed quickly, the ammonia frequently reaches the vicinity of 10 grains. But as to sulphuretted hydrogen very little excuse can be offered

for its presence but accident or carelessness; it may be easily detected by holding a paper, moistened with a solution of lead acetate, in the gas stream from a burner tip for a half minute or less; a brownish or black stain indicates sulphuretted hydrogen. This gas is removed by washing with water or ammoniacal liquor, and then passing through lime or iron purifiers, and should be completely taken out. Sulphuretted hydrogen is poisonous if inhaled, corrodes fixtures, gas cocks and meters, and does not improve the gas in any way.

A trouble not usually looked for, especially in the smaller works, is the fouling of the water in holder tanks by the absorption of ammonia and sulphuretted hydrogen; although this has been noted in former reports, yet the past year Amesbury has incurred a fine for sending out gas fouled with sulphuretted hydrogen from the tank water, while the gas was being properly purified and put into the holder clean.

The companies making gas from petroleum or its products do not, as a rule, purify their gas with lime or iron, a simple washing being sufficient; but last year, by using a different or more impure petroleum, some of the companies made a gas requiring more thorough purification to get rid of sulphuretted hydrogen, — a process for which they were not prepared.

The following eudiometric analyses have been made, the two at Holyoke with a view of determining, if possible, the reason for low candle-powers, and the remaining three in connection with the calorific tests: —

PLACE OR COMPANY.	Candle-power.	Illuminants.	Marsh Gas.	Hydrogen.	Carbonic Oxide.	Nitrogen.	Oxygen.	Carbonic Acid.
Holyoke, . .	16.0	5.55	35.25	50.60	6.60	1.90	–	0.10
Holyoke, . .	18.7	6.67	37.75	47.39	5.99	2.00	–	0.20
Boston, . .	25.0	14.98	25.90	27.87	25.30	3.04	–	2.91
South Boston, .	24.7	15.40	22.84	29.88	26.22	2.89	–	2.77
Cambridge, .	17.0	4.88	33.90	46.15	6.82	6.50	–	1.75

From the increasing use of gas for fuel purposes, it has been thought desirable to make some tests of the calorific power of various kinds of gas; but, owing to the difficulty of obtaining the necessary apparatus and of getting it into shape to carry about, only a start has been made. The apparatus used was Junker's calorimeter; and the method consisted in determining the increase in temperature of a definite volume of water and the amount of gas used in doing the work. From these results the heat units per cubic foot of gas are easily figured. Boston gas, an analysis of which appears above, was found to have a calorific value of 681.8 British Association units; that is, the heat given off from the burning of one cubic foot of this sample of gas would raise the temperature of 681.8 pounds of water one degree Fahrenheit. In like manner, South Boston gas, candle-power 24.7, specific gravity .656, was found to have a calorific value of 634.8 units. When the test was made at Cambridge, the gas was somewhat poorer than the average at that place, and so the results show what a poor coal gas will do; the candle-power being 17.0, the specific gravity .497 and the composition as in the table of analyses, the calorific value was found to be 576 units.

The assistant inspector, Mr. L. S. James, is doing his share of inspections creditably.

Respectfully submitted,

CHARLES D. JENKINS,
Inspector of Gas and Gas Meters.